when one end is rounded instead of flat, or when a column is not *exactly* perpendicular, with many other points of the greatest consequence, are seldom considered.

Mr. Hodgkinson in the report before us gives the following results of a number of experiments made by him on the strength of cast-iron pillars. The experiments were made by means of a lever compressing the ends of the pillar, which stood upright between two flat surfaces of hardened steel always parallel to each other.

"1st. It was found that a long pillar, with its ends flat and perfectly immoveable, was about three times as strong as another of the same dimensions with the ends rounded, so as to be capable of turning as on a universal joint. When one end of the pillar was rounded and the other flat, according to the definitions above, the strength was an arithmetic mean between that of the other two. In other words, if three long pillars be formed, all of equal diameter and length, and one pillar has both ends made round, another one end round and one flat, and the third both ends flat, the strength of these pillars will be as 1, 2, 3, nearly.

Some of the pillars with flat ends had discs upon the ends, to give them an increased breadth of bearing; but this, however necessary in practice, added very little to the strength.

2nd. A long pillar, with both ends flat, or firmly fixed, has nearly the same strength as one of the same diameter and half the length, with both ends rounded, as above.

3rd. If a solid pillar, be enlarged in the middle to ½, or upwards, of the diameter of the ends, and taper from the middle to the ends like frustums of two cones, whose bases are united in the middle, the strength will be increased more than the weight of the metal by about $\frac{1}{7}$ of the whole. This will be the case whether the ends are rounded or flat.

4th. Similar pillars. If long pillars be cast and turned perfectly similar, the diameter being to the length in a constant ratio, the strength was found, from a mean of several experiments, to vary as the 1·865 power of the diameter, or any other lineal dimension. It varies, therefore, nearly as the square, but somewhat lower.

5th. If a pillar with flat ends be so placed, that the pressure it sustains acts diagonally from the extremity of the diameter at one end to the opposite extremity of the diameter at the other, the strength is reduced to one-third, as was proved by several experiments. It is easy to infer, that this is a case analogous to that of a pillar with rounded ends.

6th. Relative strength of columns of different materials. Representing the strength of columns of cast-iron by 1000, I found the strength in wrought-iron 1745, cast-steel 2518, Dantzic oak 108·8, red deal 78·5.

7th. The properties of columns, enumerated above, apply to such only as have the length so great that fracture may be considered as having been produced wholly by the flexure of the column. They apply, as appears from my experiments, to all cast-iron columns with rounded ends, in which the length is more than 15 times the diameter; and to all, with flat ends, in which the length is more than 30 times the diameter, or upwards. If the pillars are shorter than this, fracture takes place partly by flexure and partly by crushing; and the properties are more complicated than as here described.

In reply to the inquiry, "Have you not given formulæ for calculating the strength of cast-iron pillars or columns?" Mr. Hodgkinson said,—I found the strength of long cast-iron columns, with rounded ends, to vary as the 3·76 power of the diameter nearly; and those with flat ends as the 3·55 power of it; the length in each case being given. When the length varied, and the diameter was the same, the strength was inversely as the 1·7 power of the length, nearly.

Taking 3·6 as an approximate term between 3·76 and 3·55, and the co-efficients, as obtained from my experiments, we have, for columns fixed at the ends.

$$W = 44 \cdot 16 \frac{D^{3 \cdot 6}}{L^{1 \cdot 7}} = \text{strength of a solid cylinder.}$$

$$W = 44 \cdot 34 \frac{D^{3 \cdot 6} - d^{3 \cdot 6}}{L^{1 \cdot 7}} = \text{strength of a hollow cylinder.}$$

where W is the breaking weight in tons; D, d the external and internal diameter in inches; and L the length in feet.

If both ends of the pillars are rounded, the strength will be $\frac{1}{3}$ of that given by the formula.

If one end be rounded, and one flat, the strength will be $\frac{2}{3}$ of that in the formula.

The preceding formulæ are applicable to columns whose length is more than 15 times the diameter, when the ends are rounded; and more than 30 times the diameter, when the ends are flat.

If the pillars are shorter than as above, they will be crushed as well as bent; and the value of W will require to be modified by the following formula:—

$$W' = \frac{W c}{W + \frac{3}{4} c}$$

where c is the weight which would crush the pillar, in tons, if it were so short as to be broken without flexure. To find c multiply the area of the section of the pillar in inches by 49; since the iron I used (the Low Moor No. 3) required 49 tons to crush a prism of it whose base was 1 inch square."

Mr. Hodgkinson considers the mean crushing strength of cast iron 47 tons per square inch, and that this is on the average, six and a half times the force necessary to tear the body asunder; the tensile strength being 7·2 tons per square inch nearly.

In conclusion, we congratulate the commissioners on the quantity of valuable information which they have brought together in their report, and express a hope that the suggestions made by Mr. Cubitt may be immediately adopted.

CHIMNEY-SHAFTS FOR BOILER FURNACES.

Schedule F of the Buildings Act, after setting forth that no chimney-shaft (except that of a steam-engine, brewery, distillery, or manufactory) must be built higher than eight feet above the slope, flat, or gutter of the roof which it adjoins, unless such chimney-shaft be built of increased thickness, and so forth, says, "And as to the chimney-shaft for the furnaces of any steam-engine, or for any brewery, distillery, or manufactory, such shaft may be erected of any height, so that it be built in such manner, and of such strength and dimensions as shall be *satisfactory to the official referees, upon special application in each case.*"

In consequence of this, the district surveyors will not permit the erection of *any* chimney-shaft for such purpose, whether of greater height than that allowed for ordinary shafts or not, without a certificate and instructions from the official referees. The mode of proceeding is to forward a drawing of the proposed shaft to the registrar, and a letter requesting permission to execute it. In reply to this a certificate is granted (on payment of the fees), containing certain instructions. These, of course, vary with circumstances: an examination, however, of a dozen or more certificates of the sort, already granted by the referees, shews the following requirements:—

The shaft must be built of sound stocks; topmost five feet in cement.

It must be bonded every six courses with hoop-iron lapped at the angles.

The base of the footings must be one-half longer than the base of the shaft, and be placed *as low as the base of the footings of any adjoining wall or building.*

If the shaft be *square*, the height of it must not exceed ten times the length of the side at the top of the footings: if *circular*, twelve times the lower diameter.

The shaft must diminish in size upwards, and be at least one-third less at the top than it is at the bottom.

The projection at head of the chimney, if any, must not exceed three-fourths of the thickness of the brickwork from which it projects.

The shaft must be lined with fire-bricks to the extent of 6 feet at the least above the opening from furnace. The fire-bricks must not be tied to nor made to support the brickwork of the structure, but be removable at will.

The shaft must not be tied to any existing building or wall, and no wood-work must be fixed in or to it.

We have given these particulars in full, not merely to enable those who may have occasion to build furnace-shafts within the limits of the Act, to prepare their plans so as to avoid being called on to make alterations, but that others may have the opinion of the referees as to the manner in which furnace-shafts whether here or elsewhere, should be constructed.

To the former, it may be useful to suggest, that when they obtain the certificate from the office they should examine how far the instructions given by the referees clash with their own particulars. The district surveyors have determined not to exercise the *slightest* discretion in the matter, but simply to see the referees' certificate rigorously carried out; so that, for example, should any precautionary measure stated in the applicant's particulars be rendered even obviously unnecessary, by some additional requirements on the part of the referees, unless the former be specially excepted, the district surveyors would insist on the execution of both.

RETROSPECTIVE REVIEWS.

Though the desire for knowledge exists in this age in a degree previously unparalleled, it often occurs that the best aids to inquiry are entirely overlooked. The extraordinary extent, to which a taste for magazine literature has spread, has given an influence to ephemeral publications, which ought rather to have been retained by a literature of standard excellence. A month often suffices to consign a really meritorious work to complete oblivion, and a modern compilation, issued in periodical numbers, has a better chance of obtaining readers than the most original conception of an old author. Even the pursuits of the antiquary have received something of the prevailing tone, and researches in progress, and volumes on fine art, damp from the press, excite a larger amount of interest, and are more frequently consulted, than the not less important records of a year gone by. In architecture, as in other sciences, many of the most important doctrines, broached as new, were promulgated in time past; but in this art, whose especial sphere it seems, to create new combinations on a foundation of recorded fact and existing precedent, it does appear matter for regret, that many important old works, and some of late date, exist in an oblivion, from which an affirmation of their merits would be sufficient to remove them. It appears to us not less the object of an architectural journal to preserve the sources of knowledge already possessed, than to record the progress of science and art; and we shall therefore endeavour, from time to time, to call to mind the existence of certain valuable authorities, which, in the active practice of an arduous profession, and the exclusive interest absorbed by recent publications, may have escaped the notice of our readers. Our limits will not allow us to enter very deeply into the subject-matter of works often voluminous and elaborate, our object being rather to indicate where information is to be sought, than to criticise where criticism has already played its part.

D'AGINCOURT'S HISTORY OF ART BY ITS MONUMENTS,

FROM ITS DECLINE IN THE FOURTH CENTURY TO ITS REVIVAL IN THE SIXTEENTH.*

The influence of the beautiful on the mind of man is exerted in other directions than is evident to the superficial observer, or is manifested in the conceptions of poetry and fine art. Not less the gift of nature than the sense of sight, or the faculty of reason, it is often potent, when other endowments are obscured or debased. The sensibility to melancholy emotions, and the sympathy with misfortune, which intercourse with the world does not entirely remove from the most callous, cherish and renovate the perceptions, and produce works which interest and delight the multitude. The study

* 325 plates, 6 vols. Paris, 1823. ("Histoire de l'Art par les Monumens," &c., &c.)